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Claims

1. (Amended Twice) A method for spatial demultiplexing interfering signals comprising the steps of
   - transforming a discreet-time input signal into a plurality of spectral components,
   - computing a set of weights for each of a plurality of channels with respect to channel fading,
   - applying said weights to said spectral components, and
   - providing for multi-stage combining of the weighted spectral components to cancel co-channel interference prior to decision processing for estimating received data symbols.

2. (Original) The method of claim 1 wherein the input signal is obtained by sampling at least one spread-spectrum signal.

3. (Original) The method of claim 2 wherein the input signal is obtained by sampling at least one received multicarrier signal.

4. (Original) The method of claim 2 wherein the input signal is obtained by sampling at least one code division multiple access signal.

5. (Original) The method of claim 1 wherein the input signal is obtained by sampling at least one discreet-time signal.

6. (Original) The method of claim 1 wherein the input signal is obtained by sampling at least one continuous-time signal.

7. (Original) The method of claim 1 wherein the discreet-time input signal is produced by sampling at least one received signal at a uniform sampling rate.

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8. (Original) The method of claim 7 wherein the received signal passes through an anti-aliasing filter before being sampled.

9. (Original) The method of claim 1 wherein the discreet-time input signal is transformed into N spectral components using an N-point discreet Fourier transform.

10. (Original) The method of claim 9 wherein the step of transforming the discreet-time input signal into the plurality of spectral components includes a spectral filtering step in which only non-redundant spectral components are passed.

11. (Original) The method of claim 9 wherein the step of transforming the discreet-time input signal into the plurality of spectral components includes combining redundant spectral components.

12. (Original) The method of claim 1 wherein the weights are complex valued.

13. (Original) The method of claim 1 wherein the weights have time dependence related to changes in the fading environment.

14. (Original) The method of claim 1 wherein the weights are determined by a training sequence.

15. (Original) The method of claim 1 wherein the weights are determined by optimization. –

16. (Original) The method of claim 1 wherein the discreet-time input signal is received from a single antenna element.

17. (Original) The method of claim 1 wherein the discreet-time input signal is received from an antenna array.

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18. (Original) The method of claim 1 wherein the discreet-time input signal is a multicarrier signal wherein each carrier of the multicarrier signal has a different spreading code and the step of transforming the discreet-time input signal into the plurality of spectral components includes a step of decoding the multicarrier signal.

19. (Original) The method of claim 1 wherein the discreet-time input signal is derived from at least two receive signals transmitted by at least one transmitter wherein the receive signals are transmitted with different beam patterns.

20. (Amended Twice) A method for spatial demultiplexing interfering signals comprising the steps of
   - transforming a discreet-time input signal that includes a plurality of interfering signals into a plurality of spectral components, the spectral components having differences in either or both amplitude variations and phase variations, and
   - providing for multi-stage demultiplexing of the interfering signals by processing either or both the amplitude variations and the phase variations of the plurality of spectral components in a multi-stage demultiplexer prior to estimating received data symbols in a decision processor.

21. (Previously Amended) The method of claim 20 wherein the step of transforming the discreet input signals includes a step of separating a plurality of interfering information signals modulated on each of the spectral components and passing the information signals to the step of providing for multi-stage demultiplexing of the interfering signals.

22. (Previously Amended) The method of claim 20 wherein the step of providing for multi-stage demultiplexing of the interfering signals involves a constellation processing method.

23. (Previously Amended) The method of claim 20 wherein the discreet-time input signals are derived from a plurality of received signals, the received signals being

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transmit signals that have propagated in a free-space or guided-wave environment after being transmitted by a plurality of transmitters.

24. (Original) The method of claim 23 wherein each of the transmit signals has a different amplitude-versus-frequency profile.

25. (Original) The method of claim 23 wherein a plurality of the transmit signals have amplitude-versus-frequency profiles that are adjusted to provide unique amplitude-versus-frequency profiles to the received signals.

26. (Original) The method of claim 24 wherein at least two of the transmitters are co-located.

27. (Original) The method of claim 23 wherein the plurality of transmitters is an antenna array.

28. (Original) The method of claim 23 wherein at least two of the transmitters have different beam patterns.

29. (Original) The method of claim 28 wherein at least two of the transmitters are co-located.

30. (Original) The method of claim 23 wherein the transmit signals have constant modulus.

31. (Amended Twice) A method for spatial demultiplexing interfering signals comprising the steps of
   • transforming a receive signal that includes a plurality of interfering signals into a plurality of diversity components, the diversity components having differences in either or both amplitude variations and phase variations, and

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- providing for multi-stage demultiplexing of the interfering signals by processing either or both the amplitude variations and the phase variations of the plurality of diversity components in a multi-stage demultiplexer prior to estimating received data symbols in a decision processor.

32. (Original) The method of claim 31 wherein the diversity components are polarization-diversity components.

33. (Original) The method of claim 31 wherein the diversity components are frequency-diversity components.

34. (Previously Cancelled) In a spatial interferometry multiplexing (SIM) method wherein a plurality of received signals received from a plurality of transmit signals transmitted by at least one transmitter have spatial gain distributions, and differences in the spatial gain distributions of different received signals is exploited by the SIM process for separating interfering signals, a method for changing the spatial gain distribution of at least one of the received signals including the step of adjusting spatial gain distribution characteristics of at least one of the transmit signals.

35. (Amended Twice) An apparatus for spatially separating a plurality of interfering received signals, each of the received signals having a different amplitude-versus-frequency profile, the apparatus comprising
- a diversity receiver adapted to separate the received signals into a plurality of frequency components, and
- a multistage spatial demultiplexer adapted to separate the received signals in the frequency components, said multistage spatial demultiplexer coupled between said diversity receiver and a decision processor adapted to estimate received data symbols.

36. (Original) The apparatus of claim 35 wherein the diversity receiver includes a filter bank.

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37. (Original) The apparatus of claim 35 wherein the diversity receiver includes a single antenna.

38. (Previously Amended) The apparatus of claim 35 wherein the spatial demultiplexer comprises
   - a weight generation unit adapted to generate a plurality of weights based on the amplitude-versus-frequency profiles of the received signals, and
   - a multistage combining unit adapted to perform multi-stage weighting and combining of the plurality of received signals using the generated plurality of weights to enhance signal to interference of at least one of the received signals by canceling interfering signals.

39. (Previously Amended) The apparatus of claim 35 wherein the multistage spatial demultiplexer is adapted to separate the received signals by comparing the received signals to a constellation of points.